Chapter 3: Getting Started

As local governments get started, they need to decide how to organize their efforts to support assessment, planning and implementation. The seven initial management tasks are:

A. Organize the Core Team
B. Develop a Watershed-Based GIS
C. Gather Existing Watershed Data
D. Delineate Subwatershed Boundaries
E. Develop Initial Goals
F. Develop a Realistic Scope for a Watershed Plan
G. Develop an Overall Stakeholder Involvement Strategy

In general, the tasks presented in this chapter would be completed prior to receiving funding for a watershed plan.

A. Organize the Core Team

Watershed planning can only be effective when the talents of many people are combined into a "core team" to take advantage of their diverse skills, professional disciplines, and experience. The team must also draw heavily from many different disciplines – local government planners, engineers, foresters, wetland scientists, hydrologists, geomorphologists, water quality experts, and educators to name just a few. The team is often physically located in many different places and plays different roles in the planning process – some may be local government staff, consultants, or watershed groups. If a Total Maximum Daily Load (TMDL) implementation committee currently exists for the watershed, there may be an opportunity to consolidate resources and meetings.

The core team should meet several times when scoping the preparation of a local watershed plan to oversee plan development and implementation, define team roles and tracking, and determine how stakeholders and partners will be involved.

The core team may decide that it does not have enough resources in-house to complete the watershed plan. In this instance, the core team may consider using its dollars more effectively by hiring a consultant to complete the plan. Tips for utilizing a consultant are outlined in Table 3.1.

Table 3.1 Tips for Utilizing a Consultant
• Select consultants with demonstrated capabilities to conduct the work, work experience in the region, and/or work experience with a particular type of watershed issue (e.g., source water protection, special habitat protection, floodplain management) • Require multidisciplinary teams that include skills or expertise in GIS, land use planning, biology, water quality, hydrology, and engineering • Require that the consultant use the framework presented in this guide to scope out the work • Require a clear description of deliverables • Require frequent meetings with the core team to track progress and solicit input • Consider keeping some tasks in-house or designating them to a local watershed group to reduce costs • Understand who the primary point of contact will be and be comfortable that the core team can work productively with them • Evaluate where past consultant efforts stand with respect to implementation • Evaluate past consultant work products and determine whether it seems to be compatible with project objectives • Do not always go with lowest bidder, if possible • The RFP/scope of services should always be as specific as possible

B. Develop a Watershed-Based GIS

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Watershed GIS

A watershed-based Geographic Information System (GIS) provides the foundation for many subsequent desktop and field assessment methods outlined in Table 3.2. Local governments often have different GIS resources and analysis capabilities; the methods described in this guide assume a basic level of access to GIS resources. The core team should take advantage of the many excellent GIS resources available from State agencies (see User's Guide Tool 2 for a listing).

GIS mapping is the most effective way to organize and view all the data collected about a watershed and its subwatersheds. Spatial representation makes it easier to simultaneously analyze various types of data, visualize watershed impacts, view protection and restoration opportunities, and track changes over time. The basic concept is that the GIS will be the primary tool to store, organize and analyze all data generated throughout the watershed planning process.

The core team should evaluate current GIS resources to determine if they are versatile enough to support analysis at both the watershed and subwatershed scale, and can handle broad screening assessments as well as detailed project tracking. In many cases, the team will discover that their current GIS lacks key data layers and that new or expanded GIS layers must be developed. The core team should take care to indicate the resolution and date of any new layers developed as a result of the watershed plan.

In general the more local the data source is, the better the resolution (local vs. state vs. national). A wealth of GIS data is available from the State agencies, but local data should be used when available.

Table 3.2: Useful Mapping Data for Watershed Planning			
Data Type	*GIS Layer*[1]	*Commonly Used For*	*Sources*[2]
Hydro-geomorphic Features	• Hydrology • Topography (10 ft contour)	• Delineating subwatershed boundaries • Watershed characterization • Developing project concept designs • Estimating pollutant loads and reductions • Conducting stream and upland assessments • Conducting project investigations	CBP MD DNR USGS Local data NRCS
Boundaries	• Watersheds • Municipal boundaries • Property/Parcel boundaries	• Delineating subwatershed boundaries • Watershed characterization • Land use analysis • Impervious cover analysis • Developing project concept designs • Conducting stream and upland assessments • Conducting project investigations	MD DNR MDP Local data
Land Use and Land Cover	• Aerial photos • Land use • Zoning • Impervious cover layers	• Delineating subwatershed boundaries • Watershed characterization • Land use analysis • Impervious cover analysis • Classifying and ranking subwatersheds • Developing project concept designs • Estimating pollutant loads and reduction • Conducting stream and upland assessments • Conducting project investigations	MD DNR MDP Local data
Sensitive Areas	• Wetlands[3] • Contiguous forest[4] • Rare, threatened and endangered species[5] • Floodplain • Soils • Green infrastructure • Public drinking water supplies • Protected lands • Shorelines • Steep slopes	• Watershed characterization • Land use analysis • Impervious cover analysis • Impervious cover analysis • Sensitive areas analysis • Classifying and ranking subwatersheds • Developing project concept designs • Estimating pollutant loads and reduction • Conducting project investigations	MD DNR MDE MDP USGS FEMA FWS Local data NRCS
Utilities	• Sanitary sewer network • Storm drain network • Stormwater treatment practices • Stormwater outfalls	• Delineating subwatershed boundaries • Prioritizing subwatersheds • Classifying and ranking subwatersheds • Developing project concept designs • Estimating pollutant loads and reduction • Conducting stream and upland assessments • Conducting project investigations	Local data

Table 3.2: Useful Mapping Data for Watershed Planning			
Data Type	*GIS Layer*[1]	*Commonly Used For*	*Sources*[2]
Point Sources and Hotspots	• Discharge permits • ESC construction permits	• Watershed characterization • Classifying and ranking subwatersheds • Developing project concept designs • Estimating pollutant loads and reduction • Conducting stream and upland assessments • Conducting project investigations	EPA Local data MDE
Stream Condition	• Fish health • Benthic macroinvertebrate health • Physical in-stream habitat • Water quality • Designated uses	• Delineating subwatershed boundaries • Watershed characterization • Summary of monitoring data • Classifying and ranking subwatersheds • Estimating pollutant loads and reduction • Planning for indicator monitoring • Conducting stream assessments	MD DNR EPA USGS Local Data MDE

Notes:
1: Derivatives from existing layers are not included in this table
2: Chesapeake Bay Program (CBP); Maryland Department of Natural Resources (MD DNR); United States Geological Survey (USGS); Maryland Department of Planning (MDP); U.S. Environmental Protection Agency (EPA); US Fish and Wildlife Service (FWS)
3: MD DNR's Wetlands Inventory layer is recommended over National Wetlands Inventory layer
4: Data layer is available through MD DNR but is referenced as potential Forest Interior Dwelling Species (FIDS) habitat
5: Data layer is available through MD DNR but is referenced as Sensitive Species Project Review Area and/or Natural Heritage Areas.

C. Gather Existing Watershed Data

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Existing Data

Accessing existing watershed data and critically evaluating its quality is essential to derive key watershed management variables used in subsequent tasks. This task is really an expansion of the previous task, but here the team identifies data and studies that may not necessarily be available in GIS format. Instead, this data may be found in another electronic format, databases, and published or unpublished reports. The team should search for watershed data in the following documents and studies:

- Coastal Bays Management Plan(s)
- NPDES Phase I and II Permit Applications
- Source Water Assessments
- Tributary Strategy Basin Summary
- USGS hydrology gauging stations
- Volunteer monitoring data
- Local floodplain modeling studies
- Environmental Impact Statements and Assessments
- Comprehensive plans
- Water and sewer plans
- TMDL
- Local codes and ordinances
- Local data on watershed population and demographics
- Field Surveys (e.g., breeding bird inventory conducted by a local university)

The team then consolidates the data into a central repository such as a GIS where it can be organized and reviewed. The quality of each historical data source should be critically reviewed, since it often was collected using different sampling methods, protocols and detection limits. User's Guide Tool 3 provides an extensive listing of monitoring resources available for Maryland communities.

D. Delineate Subwatershed Boundaries

The first test of a watershed-based GIS is subwatershed delineation. If local governments do not have a watershed layer, they may want to consider downloading the Maryland 8-digit watershed boundary layer from MD DNR's website. Additional discussion on watershed scales can be found in Chapter 2.

In reality, teams should exercise considerable discretion when drawing subwatershed boundaries to make sure they serve practical management purposes. Subwatershed boundaries are typically defined by high points in the topography where a drop of water landing outside of the boundary would drain to a different stream. An exception may include urban areas where storm drainage networks can extend subwatershed boundaries beyond the topographic ridge. The steps for delineating subwatershed boundaries are outlined below:

Step 1: Define the Origin: The origin of the subwatershed is usually located slightly below the confluence of two second order streams. Additional considerations for defining the origin are illustrated in Figure 3.1 and are described below:

- <u>Subwatershed size</u> - The average size of subwatersheds should be 10 square miles or less.

- <u>Subwatershed orientation</u> - The general convention is to define subwatersheds along the prime axis of the mainstem of the primary water body, and then number them in clockwise fashion around the watershed.

- <u>Jurisdictional boundaries</u> - Wherever possible, subwatershed boundaries should be drawn so that they are wholly contained within a single political jurisdiction to simplify the planning and management process.

- <u>Homogeneous land use</u> - To the greatest extent possible, boundaries should try to capture the same or similar land use categories within each subwatershed. When sharply different land uses are present in the same subwatershed (e.g., undeveloped on one side, commercial development on the other) it may be advisable to split them into two subwatersheds.

- <u>Ponds / lakes / reservoir</u> - Where feasible, boundaries should be extended downward to the discharge point of any pond, lake, or reservoir present in the stream network.

- Existing monitoring stations - Boundaries should always be extended to include the location of any existing monitoring stations.

- Major road crossings - It is good practice to fix the subwatershed at major road crossings or bridges in the stream segment, since crossings often coincide with stream access and possible monitoring stations.

- Direct drainage - Direct drainage is often neglected in the delineation process, but it is advisable to aggregate all small direct drainage areas into a single "unit subwatershed" for analysis purposes.

Step 2: Evaluate Surrounding Topography: Use the contours to quickly evaluate the surrounding topography. Important features to note include ridges, which are high areas indicated by a series of contour lines that "point" toward a lower elevation, and valleys and ravines, which are indicated by contour lines that "point" to a higher elevation. The core team should utilize a topography layer that has a contour interval no greater than 10-foot.

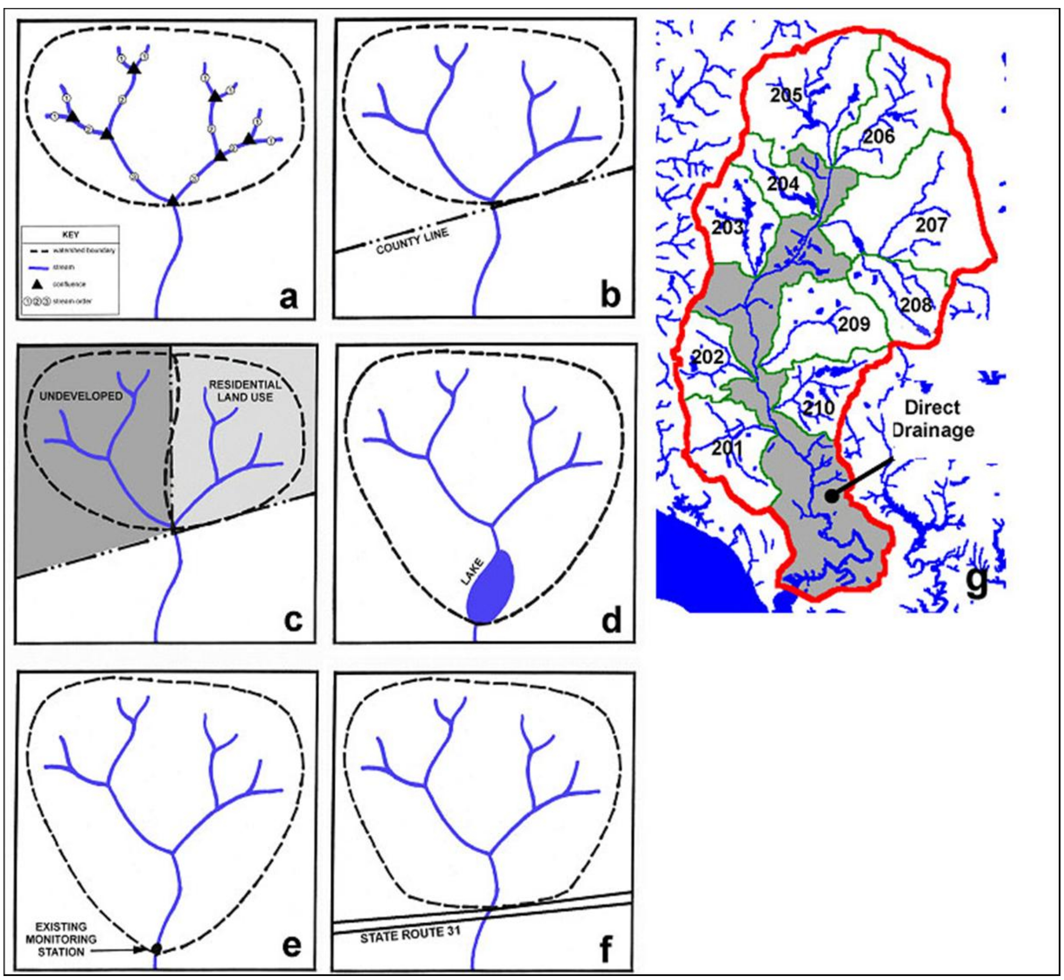

Figure 3.1: Subwatershed Origin Considerations

Step 3: Identify Breakpoints: Breakpoints are the points of maximum elevation from stream channels. Breakpoints are identified by following the banks of the stream to the highest elevation.

Step 4: Connect Breakpoints: Connect the breakpoints, beginning and ending with the origin, to form a polygon. When connecting the breakpoints the contour lines should be crossed at right angles (see Figure 3.2).

Step 5: Double Check: The core team should sample points along the edge of the boundary and make sure that points inside the boundary drain to the stream and points outside the boundary drain to another stream.

These steps should be repeated for each subwatershed within the Maryland 8-digit watershed. Once delineated, the subwatershed boundary should be transferred into GIS as a new layer. In some cases, automated watershed delineation tools may be available for GIS. While these tools may be a good starting point for determining initial boundaries, the resolution may be too coarse to accurately delineate subwatersheds as many rely on 30 meter Digital Elevation Models (DEMs). Local DEMs (2 meter resolution) can make for an accurate and easy method to depict subwatershed boundaries.

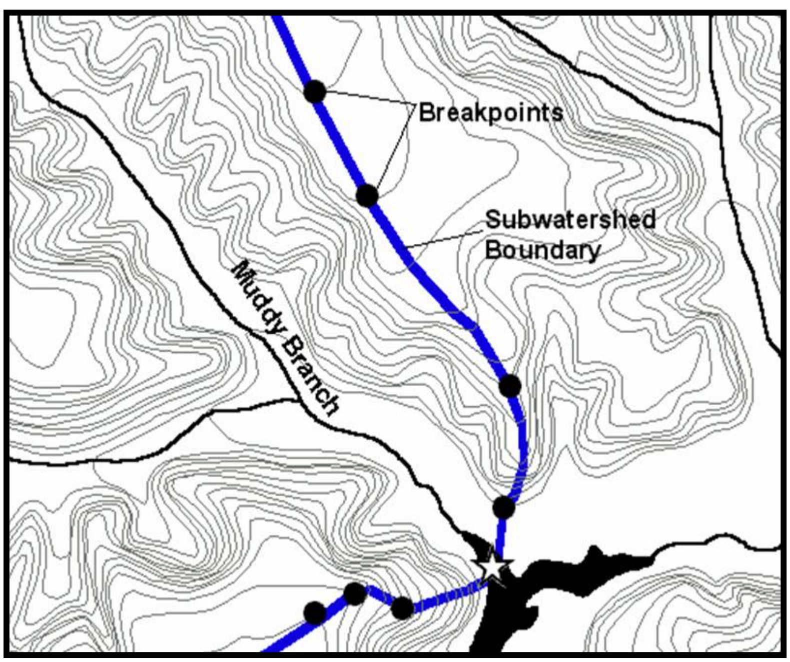

Figure 3.2: Connect breakpoints starting at the origin

E. Develop Initial Goals

Developing initial goals allows the core team to create a realistic scope for the watershed plan and focus planning dollars on the most critical data gaps and water quality priorities.

This task represents the first iteration of the goal setting process. Goals are revised, updated and expanded as the core team becomes more familiar with stream and upland conditions and receives stakeholder input. Goals are revisited again in Chapter 6, Stakeholder Involvement Methods and Chapter 7, Management Methods.

The core team should use the data gathered from the previous tasks to view the boundaries of the Maryland 8-digit watershed, tributary basin, 303(d) listings, TMDLs and supporting technical documentation and designated uses and get a general idea of the characteristics of the area. When combined with local expertise, the core team normally has enough background information to create initial watershed planning goals.

Goals are general statements of purpose or intent that express what watershed planning will broadly accomplish (see Table 3.3). Initial goals should reflect the general character of the area (highly urbanized vs. agricultural inputs) and address pollutants of concern. 303(d) impairments should automatically become the focus of one or more goals. Other important considerations include conservation areas vulnerable to development and erosion and physical impacts (e.g., floodplain disconnection). Goals should not only reflect what needs fixing but what needs protecting as well.

Table 3.3 Example Watershed Planning Goals (modified from the Lower Patuxent River Watershed Restoration Action Strategy)
• Reduce nutrient and sediment pollution to the Lower Patuxent River by addressing priority nonpoint pollution sources. • Increase understanding and awareness of watershed issues and promote action and stewardship responsibilities among commercial and residential stakeholders. • Have in place programs and development criteria to reduce the impact of future growth on the Patuxent River. • Protect and restore sensitive and natural resource areas such as contiguous and interior forests, environmentally sensitive areas and intact stream buffers. • Maintain current character of the county and quality of life.

F. Develop a Realistic Scope for a Watershed Plan

The core team needs to make hard choices on the scope of the plan given limited and uncertain budget resources. As an example, the total budget for a full-blown watershed plan following all the principles and methods presented within this guide can easily exceed $100,000. Even when funding is spread out over several years, it is certainly a hefty and often unaffordable investment for many local governments (see User's Guide Tool 4 for potential funding sources). Therefore, most teams will really need to economize on the scope of work to get the maximum planning information for the least cost. Four tips are provided below:

Tip 1: Establish a realistic overall budget and planning horizon. As noted earlier, the price tag is high for a full watershed plan. The team should develop a ballpark estimate of how much total funding will be needed for the watershed plan and then estimate what funding is realistically available over the short term. Table 3.4 provides some basic rules of thumb on budgeting and estimating costs.

Table 3.4: Rules of Thumb on Budgeting and Estimating Costs
• Project management equals 5-10% of budget • Office time equals twice the field time for assessment tasks • Design and Contingency rules (20-30% of construction costs) • Don't forget travel, equipment, and printing • Overhead Costs – many funding sources only cover a small portion of this, if at all • Fringe Rate Costs (20-30% of direct salary) • Ratio between planning and implementation costs should be close to 15:85 • You should estimate \$150-\$200K for watershed planning costs (<50 sq mile)

Tip 2: Estimate the watershed factors that will drive the scope. The scope of most plans is directly related to the following watershed factors:

- Watershed area (square miles)
- Number of subwatersheds
- Number of stream miles
- Estimated number of projects
- Data gaps
- Number of existing stakeholders, partners, and agencies that participate

The cost to perform a plan generally increases in direct proportion to each factor. The core team should measure or estimate each watershed factor at the start of the budgeting process to get a more accurate handle on the scope for planning.

Tip 3: Decide which methods can be dropped or reduced in scope. While most methods are essential, some are optional and can be dropped, deferred or restricted in scope. Optional methods are desirable to perform and certainly contribute to effective plan implementation, but they may not be initially needed to support the process. At this time, the core team will also need to make key decisions regarding what desktop and field assessment methods are most appropriate (see Chapters 4 and 5). If a method does not help the core team to achieve one of the initial goals, the method may not be the best use of funding.

The team should carefully scrutinize the remaining essential methods to look for scope "creep." This refers to situations where the scope of a particular method produces more information than is really needed to make a good decision. In particular, the team should resist the temptation to over-analyze, over-report, over-monitor or over-model. User's Guide Tool 6 provides two examples of scopes written for very different watershed planning scenarios. These scopes illustrate how different methods are selected based on watershed characteristics, size, and available data.

Tip 4: Choose the methods that deserve greater investment. Just like regular investing, the scope should be analyzed to make sure funds are allocated properly. Several investment ratios can help allocate effort within a scope of work, including the ratio of funding allocated to:

- Planning vs. implementation
- Each of the four basic watershed planning methods

The desirable ratio of planning to implementation should be about 15:85 over the entire planning horizon. The basic idea is that on-the-ground project implementation should always be the ultimate outcome. While advance funding for full implementation seldom exists, stakeholders should clearly understand that planning efforts are merely a minor down payment compared to future implementation costs.

The second ratio looks at how funding is allocated to the four types of watershed planning methods – desktop analysis, field assessment, stakeholder involvement, and management (see Figure 3.3). In general, about 75% of the total work should be split between desktop analysis and field assessment methods. The remaining 25% of the work effort is normally allocated to stakeholder involvement and management methods, in roughly equal proportions. More funds should be invested into stakeholder involvement methods if awareness is low or watershed groups do not exist. Likewise, greater investment in management methods is warranted if local governments lack prior experience in watershed planning.

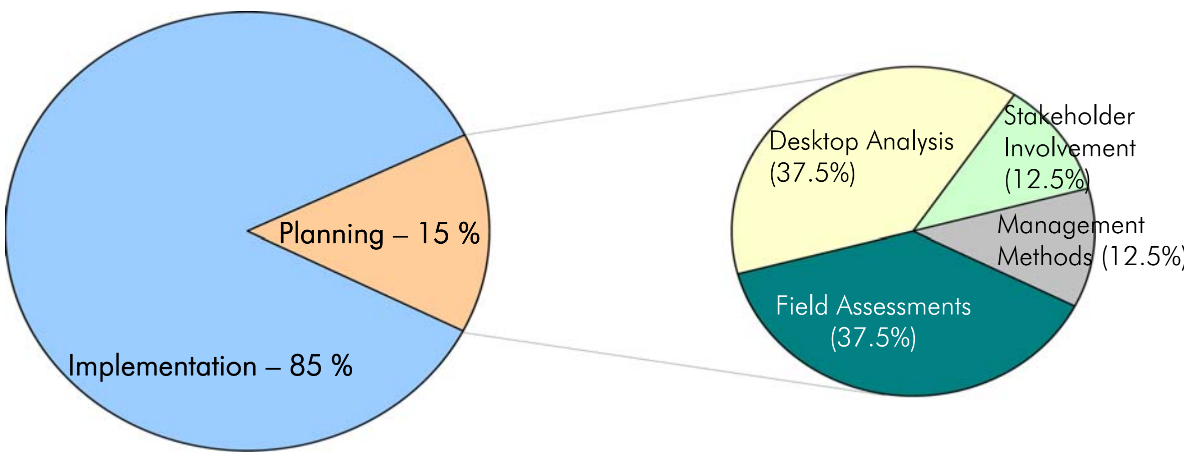

Figure 3.3: Breakdown of watershed planning funding

G. Develop an Overall Stakeholder Involvement Strategy

Watershed planning is driven by the goals of those that care for the watershed. Aligning the efforts and resources of stakeholders towards common goals is critical to the adoption and implementation of any watershed plan. Not all stakeholders are equal. In a literal sense, each has a different stake in the outcome of the plan, and each is expected to perform a different role in the local watershed planning effort. Each comes to the table with varying degrees of watershed awareness, concern and/or expertise. Stakeholders also have different preferences as to how, when and in what manner they want to be involved in the process.

Stakeholders can generally be grouped into four broad categories that include the public, agencies, watershed partners and potential funders (see User's Guide Tool 1 for contact information of potential agencies and funders to incorporate). As a result, the outreach methods used to educate and inform stakeholders must be carefully calibrated to match their different levels of knowledge and understanding. For example, some stakeholders are professionals expected to be at the table because of their job duties, whereas others are "night-timers" who are donating their time and expertise. An effective core team will recognize the wide diversity in stakeholders, and structure its planning process to provide multiple options and opportunities for involvement. Methods on stakeholder education and involvement are described in Chapter 6.

Considering these issues, the core team should think through an overall strategy to involve stakeholders during the watershed planning process that focuses on the following factors:

- What stakeholder groups need to be involved in the watershed planning process?
- Which organization will take the lead to manage stakeholders?
- What are the most effective and affordable techniques to reach out to them?
- What roles and responsibilities will they be assigned?
- Is a watershed planning website needed?